

# New Features in IWFM: HEC-DSS File Accessibility and Time-Tracking

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IWFM Users Group Meeting

**Can Dogrul**

**California Department of Water Resources**



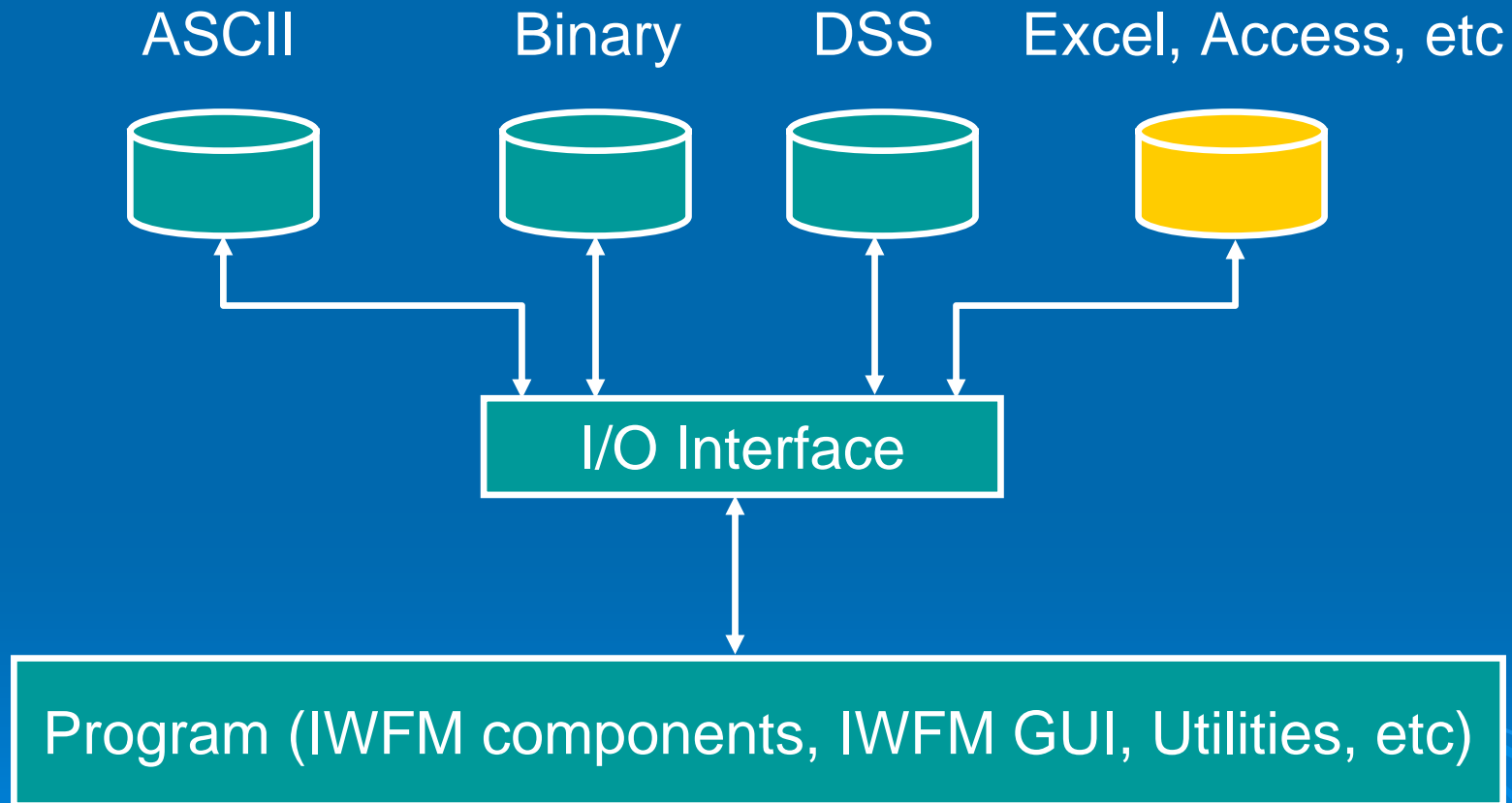
# Objectives of New Features

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- Increase the user-friendliness and efficiency of data processing by introducing date-time stamp to input time series data and simulation results
- Utilize a database (HEC-DSS) other than flat files that is specifically designed for time series data, and that comes with utilities to analyze and manipulate such data
- Decrease the need for modifying the data files when simulation period and/or time step are changed
- Maintain the previous functionality of being able to read from and write to flat files
- Move towards a modular or object-oriented programming paradigm for an easily maintainable and extensible code



# New IWFM Database Connectivity Concept



# Time-Tracking

- User has two simulation options:
  - with time-tracking (real applications)
  - without time-tracking (theoretical studies)
- For time-tracking simulations **MM/DD/YYYY\_hh:mm** format has been adopted for time stamps
- For time-tracking simulations midnight is 24:00
- For time-tracking simulations, only time steps recognized by DSS files can be used; 1 minute is the smallest time step
- For recycled time-series input data (e.g. ET) the YYYY part of time stamp is taken to be 3000



# Time-Tracking *(continued)*

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- A potentially time-series input data is allowed to be constant throughout time-tracking and non time-tracking simulations
- ASCII files can be used for input and output with any type of simulation; DSS files can be used for input and output only with time-tracking simulations
- Both ASCII and DSS files for input and output can be used in the same simulation



# Time Series Input Data Issues

- For rate-type time series data, the time unit is assumed to be the interval of data; when constant values are used the user should make sure that the time unit of data is the same as the consistent time unit of simulation
- The intervals of time series input data need to be synchronized with the simulation time step

1) Example: Monthly time series data, monthly simulation ✓

TS data      |-----|-----|-----|-----|-----> t

Simulation    |-----|-----|-----|-----|-----> t



# Time Series Input Data Issues (*continued*)

2) Example: Monthly time series data, daily simulation ✓

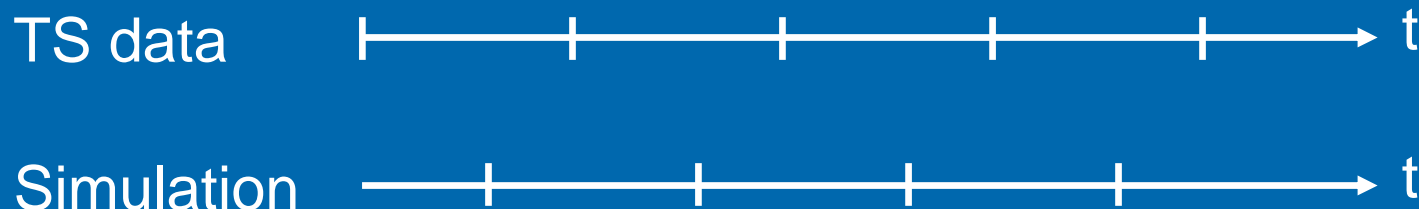
TS data       t

Simulation       t



# Time Series Input Data Issues (*continued*)

- 3) Example: Monthly time series data, monthly simulation, observation times of data don't match simulation intervals ✕





# Time Series Input Data Issues (*continued*)

4) Example: Monthly time series data, weekly simulation ✕

TS data      |-----|-----|-----|-----|-----> t

Simulation    | | | | | | | | | | | |-----> t



# Time Series Input Data Issues (*continued*)

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5) Example: Monthly time series data, yearly simulation ✕

TS data      |-----|-----|-----|-----|-----> t

Simulation    |-----|-----> t



# Example Data Files and Runs...

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# HEC-DSS Primer

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- DSS is a database format designed by Hydrologic Engineering Center of U.S. Army Corps of Engineers specifically for time-series data encountered in hydrologic applications
- HEC-DSS is incorporated into most of HEC's major application programs (HEC-RAS, HEC-HMS, etc)
- DSS utilities (HEC-DSSVue and DSS Excel add-in) can be downloaded from HEC's web site at [www.hec.usace.army.mil](http://www.hec.usace.army.mil)



# HEC-DSS Primer *(continued)*

- A DSS file is a container for many sets of time series data
- Each time series data is tagged by a pathname (maximum of 80 characters) that is made of 6 parts (maximum of 32 characters each):

/ A / B / C / D / E / F /

where

A : Project name

B : Location

C : Data variable; e.g. FLOW, PRECIP

D : Starting date of data block

E : Data time interval; e.g. 1MIN, 1DAY, 1MON

F : Additional user-defined description



# HEC-DSS Primer *(continued)*

- Example DSS pathname:

/ IWFM / GAGE1 / PRECIP / 01JAN1920 / 1MON / PRECIPITATION  
/ C2VSIM / SARB / FLOW / 01JAN1980 / 1DAY / STRM\_FLOW

- Four types of data are supported:

<u>Data Type</u>	<u>Example</u>
PER-AVER	Monthly flow
PER-CUM	Incremental precipitation
INST-VAL	River stage
INST-CUM	Precipitation mass curve

\* IWFM uses PER-AVER



# HEC-DSS Primer *(continued)*

- DSS can be used to store regular-interval time-series, irregular-interval time-series and paired data
- To store data in DSS, free Excel add-in downloadable from HEC web site can be used
- HEC-DSSVue can be used to visualize and manipulate the time series data stored in DSS files



# Conclusions

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- HEC-DSS file accessibility and time-tracking options have been implemented in IWFM
- Several other improvements and testing of the new functionalities are in progress
- The new version (IWFM v3.0) is expected to be released in Summer 2006
- Suggestions and volunteers for the beta testing of the new version are more than welcome

